Alberta Environment and Sustainable Resource Development: Report on 2011 Greenhouse Gas Emissions

May 2013

Alberta Government

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Executive Summary

Alberta's *Specified Gas Reporting Program* has collected facility greenhouse gas emissions data since 2003, and is a core component of Alberta's *2008 Climate Change Strategy*. In 2005 (for 2004 emissions data collection), Alberta harmonized its *Specified Gas Reporting Program* with the Government of Canada's *Greenhouse Gas Emissions Reporting Program*. Since then, Alberta has jointly collected greenhouse gas data from Alberta's largest industrial emitters with the Government of Canada. Alberta facilities report their emissions data to Environment Canada through the federal reporting program and the results are forwarded to Alberta Environment and Sustainable Resource Development, allowing both provincial and federal reporting requirements to be satisfied. To improve the value of data collected through the reporting program, and to further enhance the synergy with the *Specified Gas Emitters Regulation*, in 2010 Alberta lowered the emissions threshold level for mandatory reporting from 100,000 tonnes carbon dioxide equivalent (tCO_2e) in a calendar year to 50,000 tCO_2e. For the 2010 calendar year and subsequent years, any facilities whose emissions exceed 50 kilotonnes (kt) in a calendar year are required to report their greenhouse gas emissions to comply with the *Specified Gas Reporting Regulation*.

Results of the 2011 Reporting Program

For the 2011 calendar year, 164 facilities located in Alberta reported greenhouse gas emissions (this includes 17 facilities that reported voluntarily or were over the threshold due to biomass CO_2). The total reported emissions for these facilities equaled 123.3 megatonnes (Mt) in carbon dioxide equivalent, from sources of carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Since the Government of Canada's *Greenhouse Gas Emissions Reporting Program* began collecting data in 2004, reported Alberta greenhouse gas emissions have increased by 15.1 per cent and the number of reporting facilities has increased by 66, largely due to the change in emissions threshold.

Between 2010 and 2011, the number of Alberta facilities emitting over 50 kt CO_2e decreased by six from 153 to 147, while total reported emissions increased by 0.54 per cent from 122.3 Mt to 123.0 Mt. Carbon dioxide accounted for 96.2 per cent of the total emissions with the remainder coming from methane (2.7 per cent), nitrous oxide (1.2 per cent), hydrofluorocarbons (<0.01 per cent), perfluorocarbons (<0.0001 per cent), and sulphur hexafluoride (<0.001 per cent).

Reported industrial emissions accounted for 51 per cent of Alberta's total emissions. Among Alberta's industrial sectors, oil sands operations (consisting of oil sands mining and upgrading, oil sands in situ extraction, and all emissions associated with cogeneration of heat and electricity) represented the largest share of 2011 reported emissions. The breakdown of 2011 reported emissions was as follows:

- Oil Sands Operations – 39.8 per cent (23.4 per cent from oil sands mining and upgrading and 16.4 per cent from oil sands in situ extraction) of total reported emissions
- Electric Power Generation – 35.4 per cent of total reported emissions
- Conventional Oil and Gas Extraction – 6.6 per cent of total reported emissions
- Chemical Manufacturing – 5.8 per cent of total reported emissions

The remaining 12.4 per cent of emissions came from fertilizer manufacturing, petroleum and coal products, pipeline transportation, mineral product manufacturing, wood product manufacturing, coal mining, primary metal manufacturing, waste treatment and disposal, natural gas distribution, food manufacturing, and miscellaneous manufacturing.

Stationary fuel combustion accounted for 84.6 per cent of Alberta's reported emissions. The remainder of the emissions were attributed to industrial process (7.3 per cent), venting and flaring (2.8 per cent), fugitive/other (2.6 per cent), on-site transportation (2.4 per cent) and waste and wastewater (0.2 per cent) sources.

Across Canada, a total of 254.4 Mt of greenhouse gas emissions were reported in 2011 from facilities whose emissions exceeded 50 kt (note that this includes facilities that were below the 50 kt threshold, but voluntarily reported). Alberta was the largest provincial contributor at 48.5 per cent of total reported emissions, due to a large energy industry and a large portion of electricity being supplied by coal-fired power plants. Other major provincial emitters were Ontario (19.4 per cent of total reported emissions), Saskatchewan (8.8 per cent of total reported emissions), Quebec (7.9 per cent of total reported emissions) and British Columbia (5.6 per cent of total reported emissions).

Table of Contents

1 Alberta Taking Action on Climate Change 1
1.1 Goals and Policies 1
1.2 Specified Gas Reporting Program Requirements 2
1.3 Specified Gas Emitters Regulation 2

2 Specified Gas Reporting Regulation Annual Report 3
2.1 Objective 3
2.2 Report Content 3
2.3 About the Data 3
2.4 Changes to Reporting 3
2.5 Data Quality and Program Enforcement 4
2.6 Voluntary Reporting 5

3 Reported 2011 Alberta Greenhouse Gas Emissions 6
3.1 Total Reported Greenhouse Gas Emissions by Sector 6
3.2 Total Greenhouse Gas Emissions by Gas Type 8
3.3 Distribution of Total Greenhouse Gas Emissions by Facility 9
3.4 Reported Emissions by Industrial Sector and Gas Type 9
3.5 Emissions of CO_2 from Biomass Combustion and Decomposition 11

4 Reported 2011 Alberta Greenhouse Gas Emissions by Source Category 12
4.1 Total Reported Emissions by Source Category 12
4.2 Sectoral Emissions by Source Category 13
4.3 Source Category Emissions by Industrial Sector 14

5 Comparison with Previous Reporting Periods 15
5.1 Short-term Trend: Comparison of 2010 and 2011 Reported Greenhouse Gas Emissions 15
5.2 Long-term Trend: Comparison of 2004 and 2011 Reported Greenhouse Gas Emissions 17
5.3 Comparable Facilities 19

6 National Reported Greenhouse Gas Emissions 20
6.1 2011 Reported Greenhouse Gas Emissions by Province 20
6.2 2011 Facility Greenhouse Gas Emissions as a Portion of Total Provincial Emissions 21

7 Data Confidentiality and Access 22
7.1 Confidentiality Request Process 22
7.2 2011 Confidentiality Requests and Decisions 23
7.3 Publishing Greenhouse Gas Data 23
7.4 Requesting Greenhouse Gas Data 24

List of Figures

Figure 1: Total reported 2011 Alberta greenhouse gas emissions by industrial sector. 7
Figure 2: Total reported 2011 Alberta greenhouse gas emissions by gas type..... 8
Figure 3: Distribution of reported 2011 Alberta greenhouse gas emissions by facility. 9
Figure 4: Reported 2011 greenhouse gas emissions for each industrial sector by gas type. 10
Figure 5: Reported 2011 CO_2 emissions from combustion and decomposition of biomass. 11
Figure 6: Total reported 2011 greenhouse gas emissions by source category..... 12
Figure 7: Total reported industrial sector emissions by source category..... 13
Figure 8: Total reported source category emissions by industrial sector..... 14
Figure 9: Change in total reported greenhouse gas emissions by industrial sector from 2010 to 2011. 16
Figure 10: Change in reported total greenhouse gas emissions by sector from 2004 to 2011. 18
Figure 11: Total reported facility greenhouse gas emissions across Canada by Province/Territory 20
Figure 12: Reported 2011 facility greenhouse gas emissions as a percentage of total estimated Provincial/Territorial emissions..... 21
Figure 13: Confidentiality process for the *Specified Gas Reporting Program*..... 22
Figure 14: Process for requesting non-confidential greenhouse gas data from Alberta Environment. 24

List of Tables

Table 1: Total reported greenhouse gas emissions and report tally by industrial sector. 6
Table 2: Number of reports received and total reported emissions by sector for 2010 and 2011. 15
Table 3: Number of reports received and total reported emissions by sector for 2004 and 2011. 17
Table 4: Total annual reported greenhouse gas emissions for comparable facilities in Alberta. . 19
Table 5: Confidentiality request decisions for 2011 greenhouse gas data..... 23

1 Alberta Taking Action on Climate Change

1.1 Goals and Policies

The Government of Alberta is committed to reducing provincial greenhouse gas emissions, with a plan outlined in the *2008 Climate Change Strategy*. The strategy builds on what has already been done: implementing the first legislation of its kind in Canada to reduce greenhouse gas emissions, and laying out the long-term roadmap to Alberta's 2020 and 2050 reduction objectives.

The strategy reflects Alberta's unique position as an energy supplier to the world and the reality that, for the foreseeable future, the world will continue to rely on Alberta's secure supply of oil and gas. The strategy also establishes practical, achievable goals for real reductions in greenhouse gas emissions. Instead of setting arbitrary targets, Alberta's approach identifies manageable "wedges" for specific actions and establishes emissions reduction goals for each of the three wedges: conserving and using energy efficiently; implementing carbon capture and storage; and greening energy production to transform the way we produce energy. The strategy also commits to quantitative results:

Year	Target	Objective
2010	Reduce projected emissions by 20 megatonnes	Meet intensity target established in 2002 plan - Achieved
2020	Reduce projected emissions by 50 megatonnes	Stabilize greenhouse gas emissions and begin reductions
2050	Reduce projected emissions by 200 megatonnes	Emissions reduced by 50 per cent below business as usual levels and 14 per cent below 2005 levels

Alberta's provincial *Specified Gas Reporting Program* is an important aspect of managing climate change, providing real data to inform and enable effective policies for reducing emissions of greenhouse gases from facilities. The three main components of the *Specified Gas Reporting Program* are: the *Specified Gas Reporting Standard*, the *Specified Gas Reporting Regulation*, and the *Climate Change and Emissions Management Act*.

The reporting program is intended to work in concert with the *Specified Gas Emitters Regulation*. Information gathered under the program is used to assist both industry and the province in characterizing emission sources and identifying opportunities for emissions reduction. The program provides an annual inventory of greenhouse gas emissions from large facilities in the province and provides a platform for smaller facilities to voluntarily report their greenhouse gas emissions. It also assists the government in monitoring the results of greenhouse gas reduction strategies.

1.2 Specified Gas Reporting Program Requirements

The Alberta *Specified Gas Reporting Program* requires that all large Alberta facilities emitting more than 50,000 tonnes of greenhouse gases in carbon dioxide equivalent (CO_2e) units per year—based on the sum of direct emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6)—report their greenhouse gas emissions to Alberta Environment and Sustainable Resource Development. Facilities that do not exceed the 50 kt regulatory threshold may voluntarily report their emissions under the *Specified Gas Reporting Program*.

Facilities are required to submit greenhouse gas emissions reports through an electronic data reporting system, which is administered by Environment Canada. In 2005 (for 2004 emissions collection), Alberta harmonized its *Specified Gas Reporting Program* with the Government of Canada's *Greenhouse Gas Emissions Reporting Program*. Alberta has jointly collected greenhouse gas data from Alberta's largest industrial emitters with the Government of Canada since then. Alberta facilities report their emissions data to Environment Canada through the federal reporting program and the results are forwarded to Alberta Environment and Sustainable Resource Development, allowing both provincial and federal reporting requirements to be satisfied.

1.3 Specified Gas Emitters Regulation

The *Specified Gas Emitters Regulation*, a companion to the *Specified Gas Reporting Regulation*, came into effect on July 1, 2007, and is an important step in delivering on Alberta's *2008 Climate Change Strategy*. The *Specified Gas Emitters Regulation* requires all facilities in Alberta emitting over 100,000 tonnes of carbon dioxide equivalent (CO_2e) per year to reduce their emissions intensity by 12 per cent below a historical baseline. More information about the *Specified Gas Emitters Regulation* can be found on Alberta Environment and Sustainable Resource Development's website at http://environment.alberta.ca/01838.html and in the *Technical Guidance Document for Completing Specified Gas Compliance Reports* document at http://environment.alberta.ca/01089.html.

While the requirements of the *Specified Gas Emitters Regulation* and the *Specified Gas Reporting Regulation* must be satisfied independently, emissions data collected under the reduction program must be third party verified and may be used to update the reporting program database.

2 Specified Gas Reporting Regulation Annual Report

2.1 Objective

This report is designed to communicate results from the 2011 reporting year of the *Specified Gas Reporting Program* and provide analysis of those results that are not provided elsewhere to Albertans. This report builds on previous annual reports available at www.environment.alberta.ca/02166.html.

2.2 Report Content

Greenhouse gas data collected under the *Specified Gas Reporting Regulation* for the 2011 calendar year is examined by greenhouse gas type, source category, facility, industrial sector, and is also compared to previous reporting years.

2.3 About the Data

This report uses data from the Government of Canada's *Greenhouse Gas Emissions Reporting Program* that is current as of December, 2012. Any changes to the database after this date are not reflected in this report. Emissions data has been numerically rounded to present workable numbers in this report. As a result, the numbers presented may differ slightly across sections of the report and may also differ slightly from the same data presented from other sources, including past reports.

There may have been updates to portions of the 2003-2011 data sets used to develop this report. Consequently, data presented in this report may differ from what was published in previous Alberta Environment and Sustainable Resource Development greenhouse gas reports.

2.4 Changes to Reporting

The 2011 greenhouse gas data presented in this report was collected using the March 2011 *Specified Gas Reporting Standard*. A number of changes have been introduced since the reporting program began:

1) The mandatory reporting threshold was lowered to 50,000 tonnes CO_2e for the 2010 calendar year and subsequent reporting years.
2) Emissions of CO_2 from combustion and decomposition of biomass became mandatory and have been included in the emissions threshold determination.[1]
3) Supplemental data collected through the reporting program has changed to better align with the requirements of the *Specified Gas Emitters Regulation*

There have also been some changes to the way data is being reported by Alberta Environment and Sustainable Resource Development for the 2011 greenhouse gas emissions data collected under the *Specified Gas Reporting Program* compared to previous reporting years. The sectoral

[1] NOTE: Consistent with previous reports, emissions of CO_2 from combustion and decomposition of biomass are not included in the greenhouse gas emissions totals presented in this report, unless otherwise stated.

breakdown of industrial facilities has been classified based on the reported North American Industrial Classification System (NAICS) code and grouped into the following industrial sectors:

Chemical Manufacturing
Coal Mining
Conventional Oil and Gas Extraction
Electric Power Generation (previously Utilities)
Fertilizer Manufacturing
Food Manufacturing
Mineral Product Manufacturing
Miscellaneous Manufacturing
Natural Gas Distribution (previously included as a Utility)
Oil Sands In Situ Extraction
Oil Sands Mining and Upgrading
Petroleum and Coal Products
Pipeline Transportation
Primary Metal Manufacturing
Waste Treatment and Disposal
Wood Product Manufacturing (previously Paper Manufacturing)

2.5 Data Quality and Program Enforcement

The 2011 greenhouse gas emissions data that was collected under the *Specified Gas Reporting Program* has undergone checks by Environment Canada and Alberta Environment and Sustainable Resource Development to ensure facilities exceeding the threshold complied with the reporting requirement and to attempt to identify major errors in submitted data. As these are reported values, it is incumbent upon reporting facilities to submit the most accurate greenhouse gas emissions data possible.

Reporting to the *Specified Gas Reporting Program* is a mandatory regulatory requirement for Alberta facilities exceeding 50 kt CO_2e in annual greenhouse gas emissions. Facilities are required to retain all records, data and information used in the preparation of a specified gas report for at least three years after the report is submitted. These regulatory requirements ensure that facilities are submitting reasonably correct emissions information and that there is a paper trail in case Alberta Environment and Sustainable Resource Development needs to verify the submitted emissions data. Facilities that fail to meet the regulatory requirements of the *Specified Gas Reporting Program* could face enforcement action. Additional information on enforcement can be found in the *Specified Gas Reporting Regulation*, *Administrative Penalty Regulation* and the *Climate Change and Emissions Management Act*. Some facilities that do not exceed the threshold are voluntary participants in the program and are included in the inventory.

Alberta Environment and Sustainable Resource Development encourages facilities reporting into the *Specified Gas Reporting Program* to use consistent methods across different reporting years, and for similar facilities to use the same calculation methods, similar to the *Specified Gas Emitters Regulation*; however, there is currently no requirement for facilities to do so. Alberta Environment and Sustainable Resource Development is looking into the possibility of implementing such requirements for future reporting cycles. The program provides an inventory

of greenhouse gas emissions in the province for large emitters only, and does not include smaller sources of emissions.

2.6 Voluntary Reporting

Under the *Specified Gas Reporting Program*, facilities that do not exceed the 50 kt CO_2e reporting threshold may choose to voluntarily report their greenhouse gas emissions. There were 10 Alberta facilities that voluntarily reported 2011 emissions to Alberta Environment and Sustainable Resource Development. The reported greenhouse gas emissions from these 10 facilities equals a combined total of 0.29 Mt, or 0.23 per cent of the total 2011 reported greenhouse gas emissions. The individual reported greenhouse gas emissions totals from these 10 voluntary facility reports ranges from 0.68 to 48.8 kt. Alberta Environment and Sustainable Resource Development encourages industrial facilities that do not exceed the reporting threshold to voluntarily report their greenhouse gas emissions to the *Specified Gas Reporting Program.*

Alberta Environment and Sustainable Resource Development would like to acknowledge the following companies for voluntarily submitting a specified gas report for one or more of their facilities under the greenhouse gas threshold.

Dow Chemical Canada ULC
Cenovus Energy
General Scrap Partnership
Talisman Energy
SemCams ULC
Pengrowth Energy Corporation
Murphy Oil Canada Limited
EPCOR Water Services Inc.

3 Reported 2011 Alberta Greenhouse Gas Emissions

3.1 Total Reported Greenhouse Gas Emissions by Sector

In total, 164 facilities from 16 industrial sectors reported a total of 123.3 Mt CO_2e of greenhouse gas emissions in Alberta for the 2011 calendar year through the *Specified Gas Reporting Program*. Reported greenhouse gas emissions for each facility can be found in the accompanying spreadsheet document. The total reported greenhouse gas emissions and the number of reporting facilities are shown in Table 1 for each industrial sector.

Table 1: Total reported greenhouse gas emissions and report tally by industrial sector.

Sector	Reports Received	Emissions (kt CO2e)	Percent of Total
Chemical Manufacturing	12	7,101	5.8%
Coal Mining	4	649	0.5%
Conventional Oil and Gas Extraction	61	8,181	6.6%
Electric Power Generation	23	43,609	35.4%
Fertilizer Manufacturing	5	4,357	3.5%
Food Manufacturing	1	75	0.1%
Mineral Product Manufacturing	4	2,020	1.6%
Miscellaneous Manufacturing	2	3	0.0%
Natural Gas Distribution	1	146	0.1%
Oil Sands In Situ Extraction	20	20,192	16.4%
Oil Sands Mining and Upgrading	7	28,845	23.4%
Petroleum and Coal Products	5	4,054	3.3%
Pipeline Transportation	4	2,757	2.2%
Primary Metal Manufacturing	2	381	0.3%
Waste Treatment and Disposal	4	248	0.2%
Wood Product Manufacturing	9	702	0.6%
Total	**164**	**123,320**	**100.0%**

The total oil sands operations sector, which includes oil sands in situ extraction, oil sands mining and upgrading, and associated cogeneration facilities, reported the largest share of 2011 greenhouse gases in Alberta, emitting 39.8 per cent of total reported emissions, followed closely by electric power generation, emitting 35.4 per cent of total reported emissions. The conventional oil and gas extraction sector was also a significant source of emissions, emitting 6.6 per cent of the total reported emissions. The chemical manufacturing sector emitted 5.8 per cent of total reported emissions, the fertilizer manufacturing sector emitted 3.5 per cent of total reported emissions, and the petroleum and coal products sector emitted 3.3 per cent of total reported emissions. Facilities in the pipeline transportation, mineral product manufacturing, wood product manufacturing, coal mining, primary metal manufacturing, waste treatment and disposal, natural gas distribution, food manufacturing, and miscellaneous manufacturing sectors together accounted for the remaining 5.6 per cent of total reported emissions. The contribution of total reported greenhouse gas emissions by industrial sector is shown in Figure 1.

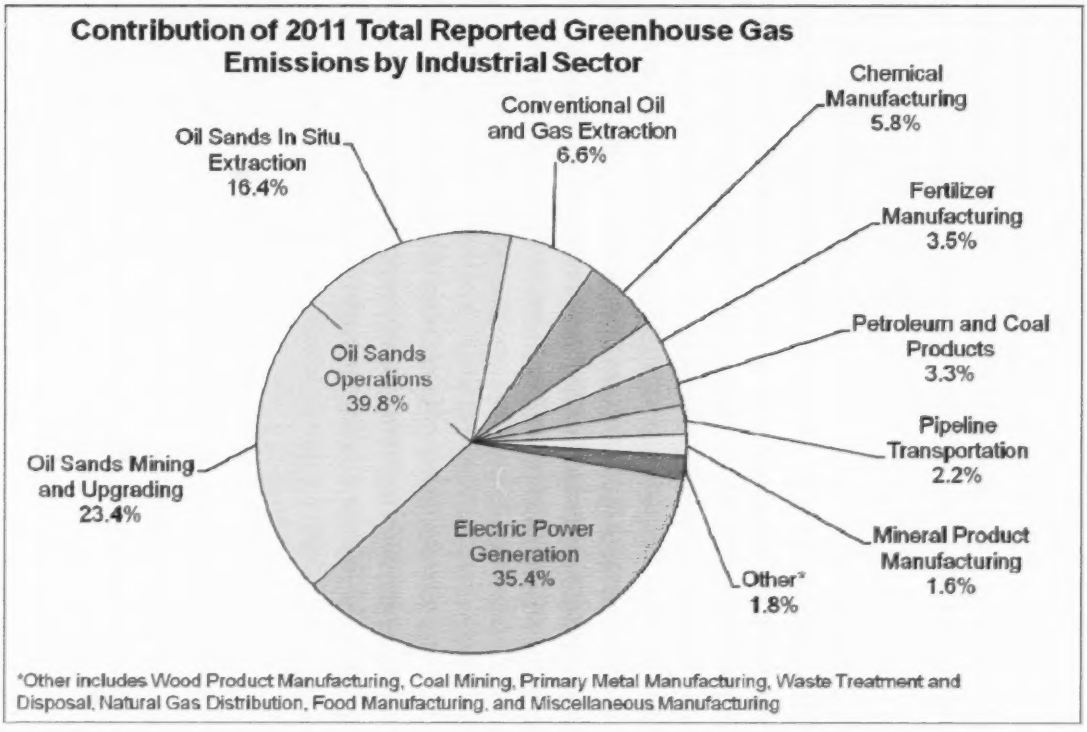

Figure 1: Total reported 2011 Alberta greenhouse gas emissions by industrial sector.

3.2 Total Greenhouse Gas Emissions by Gas Type

The Alberta *Specified Gas Reporting Program* requires six greenhouse gases to be reported: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbon (HFC) species, perfluorocarbon (PFC) species, and sulphur hexafluoride (SF_6). The emitted mass of each gas is converted to carbon dioxide equivalent units using the global warming potential values detailed in the *Specified Gas Reporting Standard*, and summed to compute total emissions. Of the 164 reporting facilities, 163 reported carbon dioxide emissions, 164 reported methane emissions, 163 reported nitrous oxide emissions, three reported emissions of hydrofluorocarbons, one reported emissions of perfluorocarbons, and four reported emissions of sulphur hexafluoride.

The largest portion of reported greenhouse gas emissions by CO_2e was CO_2, contributing 96.1 per cent of the total with 118.5 Mt. The remainder consisted of CH_4 (2.7 per cent or 3.3 Mt CO_2e), N_2O (1.2 per cent or 1.5 Mt CO_2e), HFCs (<0.01 per cent or 11.0 kt CO_2e), PFCs (<0.0001 per cent or 0.104 kt CO_2e) and SF_6 (<0.001 per cent or 0.663 kt CO_2e). The contribution of total reported greenhouse gas emissions by gas type is depicted in Figure 2.

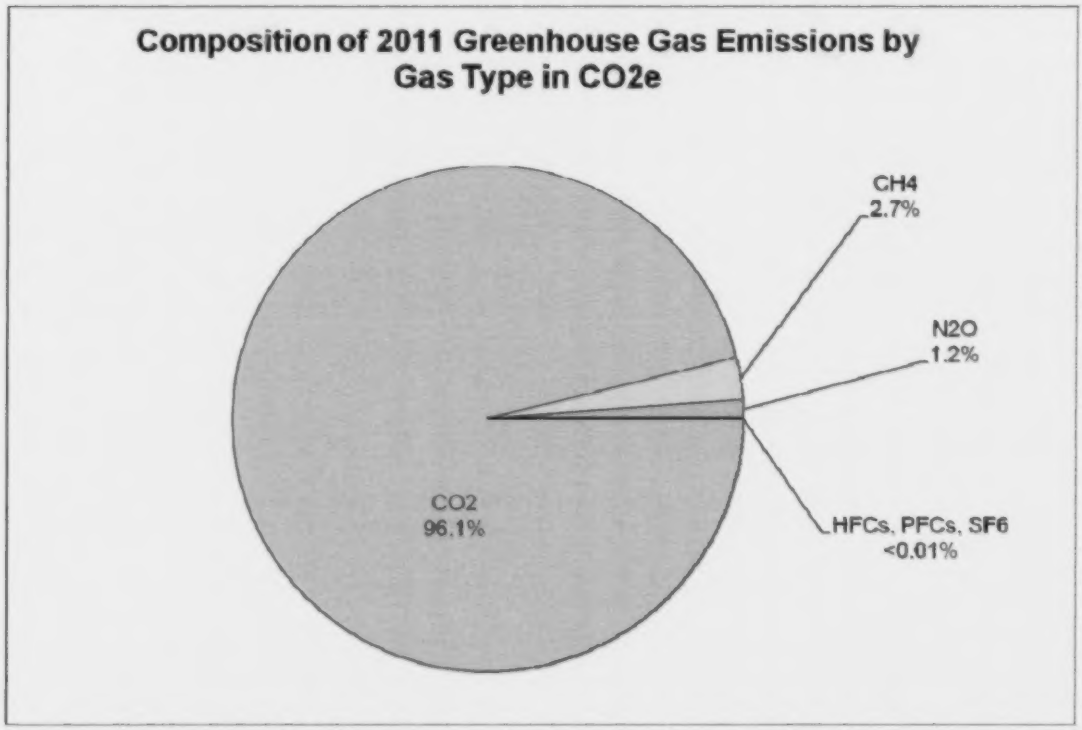

Figure 2: Total reported 2011 Alberta greenhouse gas emissions by gas type.

3.3 Distribution of Total Greenhouse Gas Emissions by Facility

Among the 164 facilities in Alberta that reported greenhouse gas emissions for 2011, a varied distribution of emissions totals can be observed at the facility level. Out of the 123.3 Mt CO_2e total reported emissions, 96.4 Mt (78 per cent) was reported by only 25 facilities, while the other 139 facilities accounted for the remaining 26.9 Mt. The eight largest emitters each reported greater than four megatonnes and together accounted for 65.5 Mt (53 per cent of total reported emissions). Of the eight largest emitters, five facilities are in the electric power generation sector, two are in the oil sands mining and upgrading sector, and one is in the oil sands in situ extraction sector. The distribution of 2011 facility emissions in order of decreasing magnitude is shown in Figure 3.

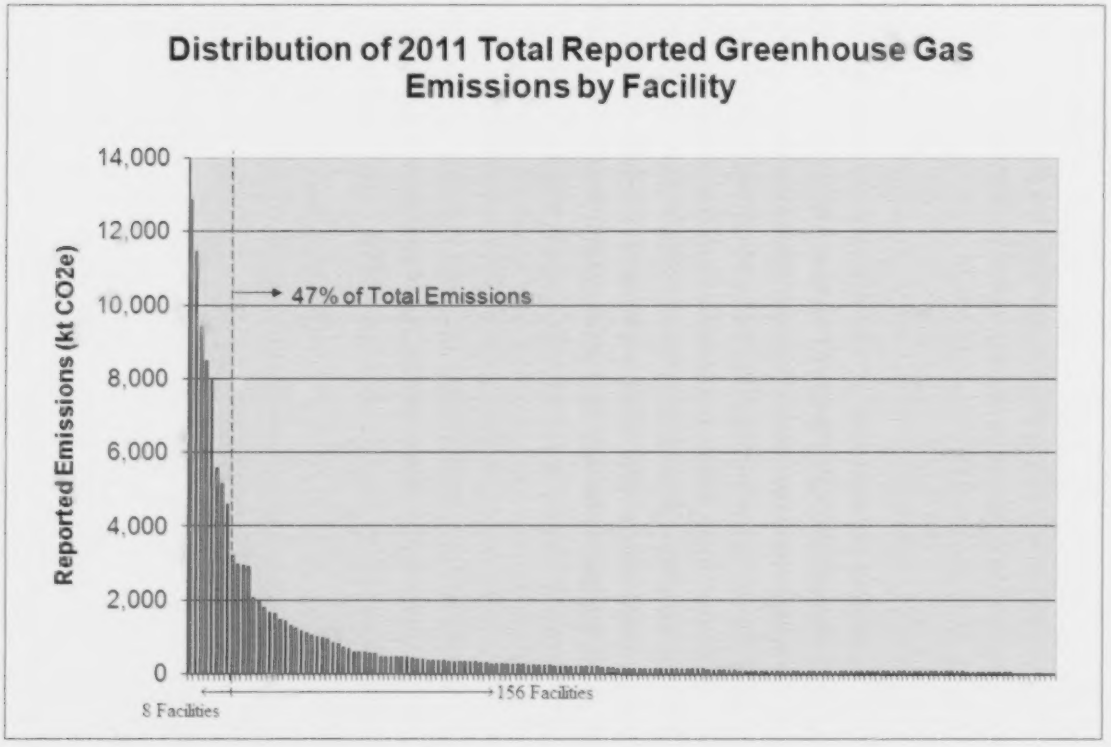

Figure 3: Distribution of reported 2011 Alberta greenhouse gas emissions by facility.

3.4 Reported Emissions by Industrial Sector and Gas Type

While CO_2 contributed the largest portion of total reported emissions, the contribution from each greenhouse gas varied across industrial sectors, as shown in Figure 4. Carbon dioxide contributed more than 90 per cent of greenhouse gas emissions for nine industrial sectors, including electric power generation, oil sands mining and upgrading, oil sands in situ extraction, chemical manufacturing, conventional oil and gas extraction, petroleum and coal products, primary metal manufacturing, mineral product manufacturing, and miscellaneous manufacturing and contributed the majority of greenhouse gas emissions in the pipeline transportation, coal mining, fertilizer manufacturing, food manufacturing, and wood product manufacturing sectors.

Methane was the majority greenhouse gas contributor in two sectors (natural gas distribution and waste treatment and disposal), and contributed greater than 10 per cent in the coal mining, pipeline transportation, and food manufacturing sectors. Nitrous oxide contributed 16 per cent of greenhouse gas emissions in the wood product manufacturing sector, 10 per cent in the fertilizer manufacturing sector, 6 per cent in the waste treatment and disposal sector, and less than 3 per cent in all other sectors. Emissions of HFCs, PFCs and SF_6 were reported in small quantities and are excluded from Figure 4.

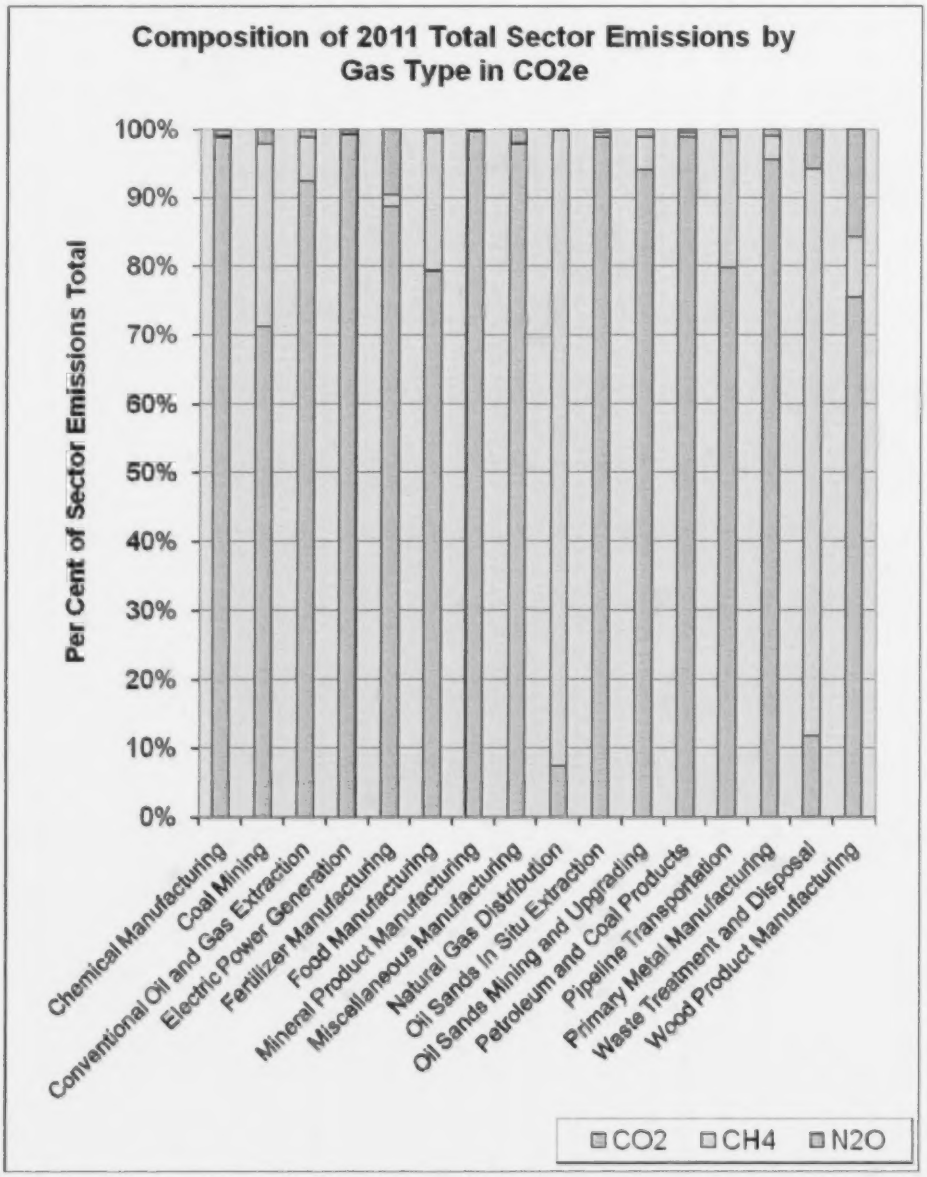

Figure 4: Reported 2011 greenhouse gas emissions for each industrial sector by gas type.

3.5 Emissions of CO_2 from Biomass Combustion and Decomposition

Emissions of CO_2 from the combustion and decomposition of biomass are considered carbon neutral by the Intergovernmental Panel on Climate Change (IPCC). Therefore, Alberta has excluded biomass CO_2 emissions from the reduction requirements of the *Specified Gas Emitters Regulation* and the total emissions quantification in this report. However, in order to gain a better understanding of direct emission sources throughout the province, the *Specified Gas Reporting Standard* was amended for the 2010 reporting year, and subsequent years, so that reporting of biomass CO_2 emissions is no longer optional, but mandatory.

For the 2011 year, a total of 5.9 Mt CO_2 from combustion and decomposition of biomass was reported. The largest contributor to this total was the wood product manufacturing sector, accounting for 5.3 Mt. The remainder was reported by the electric power generation, waste treatment and disposal, oil sands mining and upgrading, food manufacturing, chemical manufacturing, and oil sands in situ extraction sectors, in order of decreasing magnitude. The sectoral contribution to total reported biomass CO_2 emissions is shown in Figure 5.

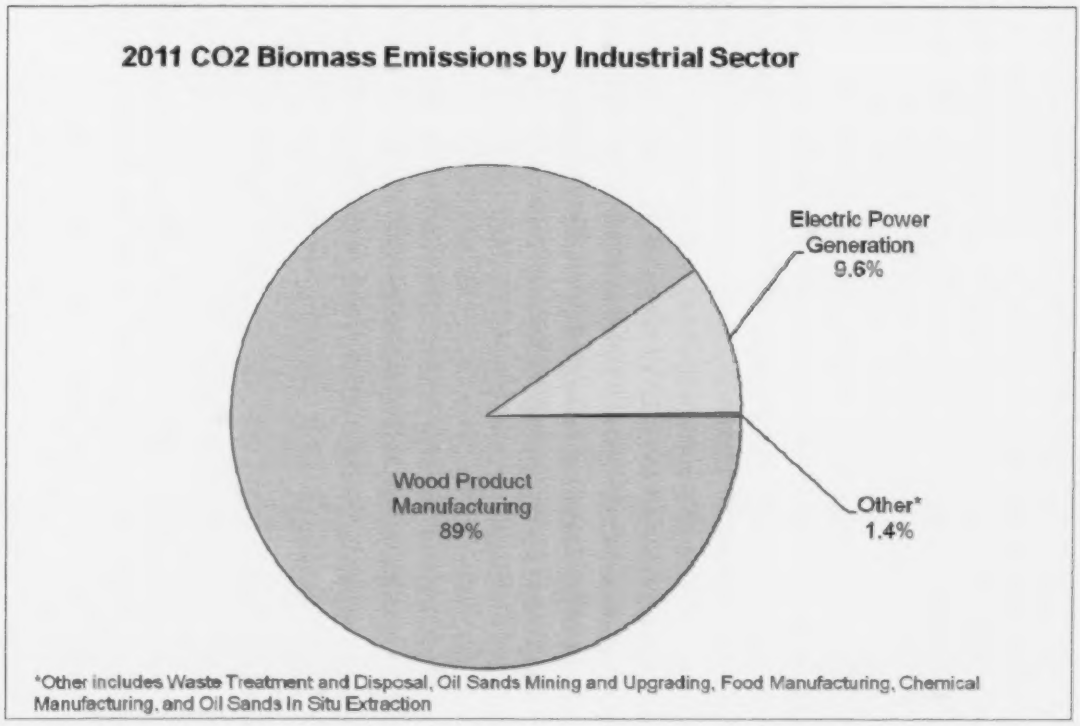

Figure 5: Reported 2011 CO_2 emissions from combustion and decomposition of biomass.

4 Reported 2011 Alberta Greenhouse Gas Emissions by Source Category

The Alberta *Specified Gas Reporting Program* requires greenhouse gas emissions to be reported according to six source categories: stationary fuel combustion, industrial process, fugitive/other, venting and flaring, on-site transportation, and waste and wastewater. A description of the source categories can be found in the Glossary of Terms.

4.1 Total Reported Emissions by Source Category

The largest source of greenhouse gas emissions was stationary fuel combustion, accounting for 104.3 Mt, followed by industrial processes, emitting 9.0 Mt. The remaining 8.0 per cent of total reported emissions was from venting/flaring, fugitive/other, on-site transportation, and waste and wastewater sources. The contribution of each source category to the total 2011 reported emissions is shown in Figure 6.

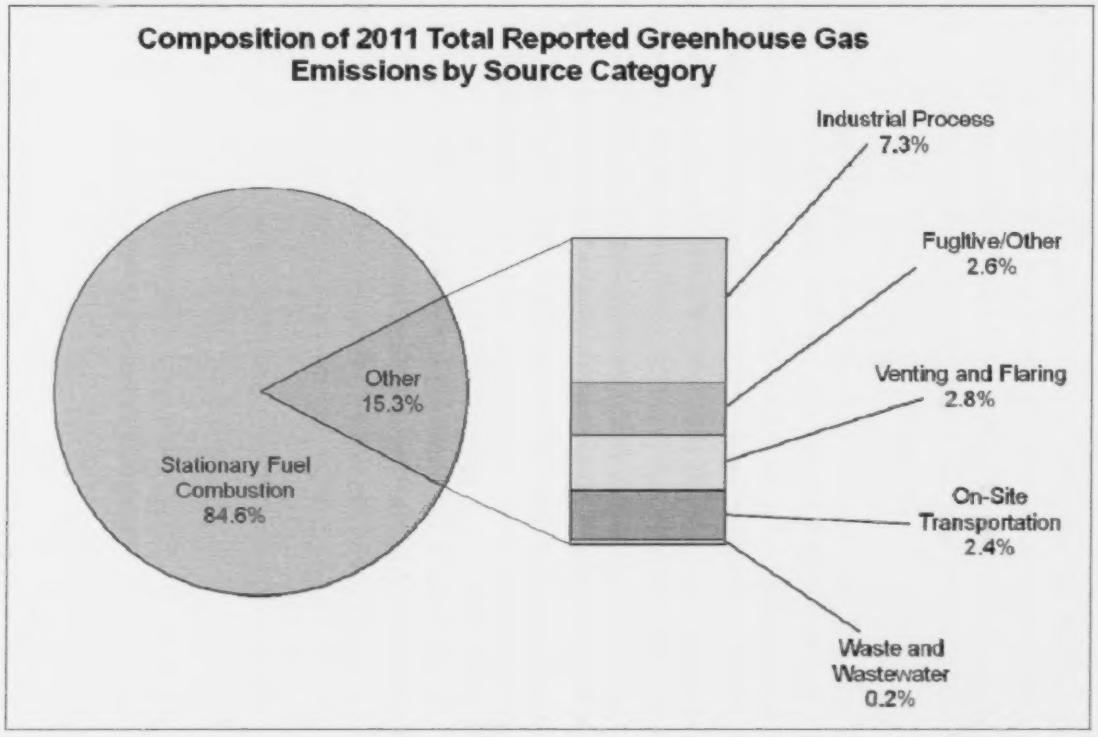

Figure 6: Total reported 2011 greenhouse gas emissions by source category.

4.2 Sectoral Emissions by Source Category

In eleven of sixteen industrial sectors, stationary fuel combustion contributed the majority of greenhouse gas emissions. In the mineral manufacturing sector, industrial process emissions contributed the majority of greenhouse gas emissions, largely due to calcination processes occurring at these facilities. The fertilizer manufacturing sector reported an almost even split between stationary fuel combustion emissions and industrial process emissions, with the former representing the majority. Transportation emissions contributed the majority of greenhouse gas emissions in the coal mining sector, primarily due to hauling of mined coal. Transportation emissions also contributed the majority of greenhouse gas emissions in the miscellaneous manufacturing sector. Fugitive/other emissions contributed the majority of greenhouse gases in the natural gas distribution sector. The relative contribution of each source category to total reported emissions in each industrial sector is shown in Figure 7.

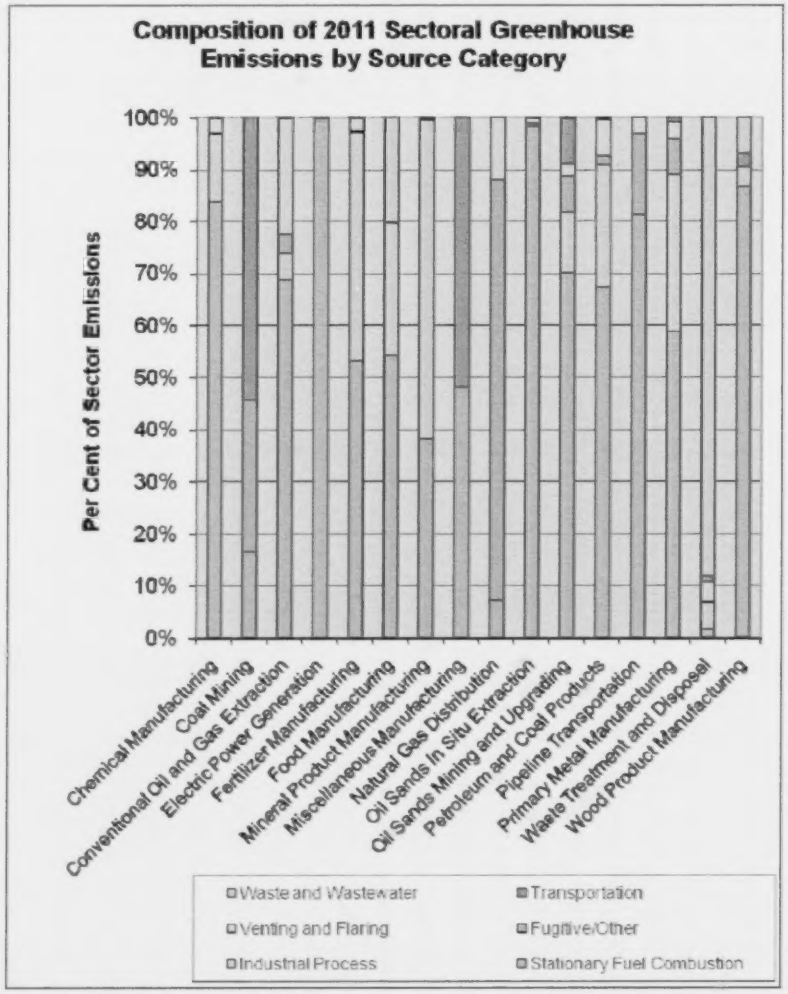

Figure 7: Total reported industrial sector emissions by source category.

4.3 Source Category Emissions by Industrial Sector

The relative contribution of each industrial sector to total reported emissions in each source category is shown in Figure 8. The stationary fuel combustion emissions sectoral composition is similar to the sectoral composition of total 2011 emissions shown in Figure 1. This similarity is not surprising, since stationary fuel combustion was the dominant source of total emissions, as noted in Section 4.1. The electric power generation sector was the largest source of stationary fuel combustion emissions, followed by oil sands mining and upgrading, oil sands in situ extraction, chemical manufacturing, and conventional oil and gas extraction. The largest contributors in the industrial process category were oil sands mining and upgrading, fertilizer manufacturing, mineral product manufacturing, petroleum and coal products, and chemical manufacturing. The largest portion of fugitive/other emissions came from the oil sands mining and upgrading sector, and the largest portion of venting and flaring emissions came from the conventional oil and gas sector. The oil sands mining and upgrading sector was also the largest contributor in the on-site transportation emissions category and the waste treatment and disposal sector was the largest contributor in the waste and wastewater emissions category.

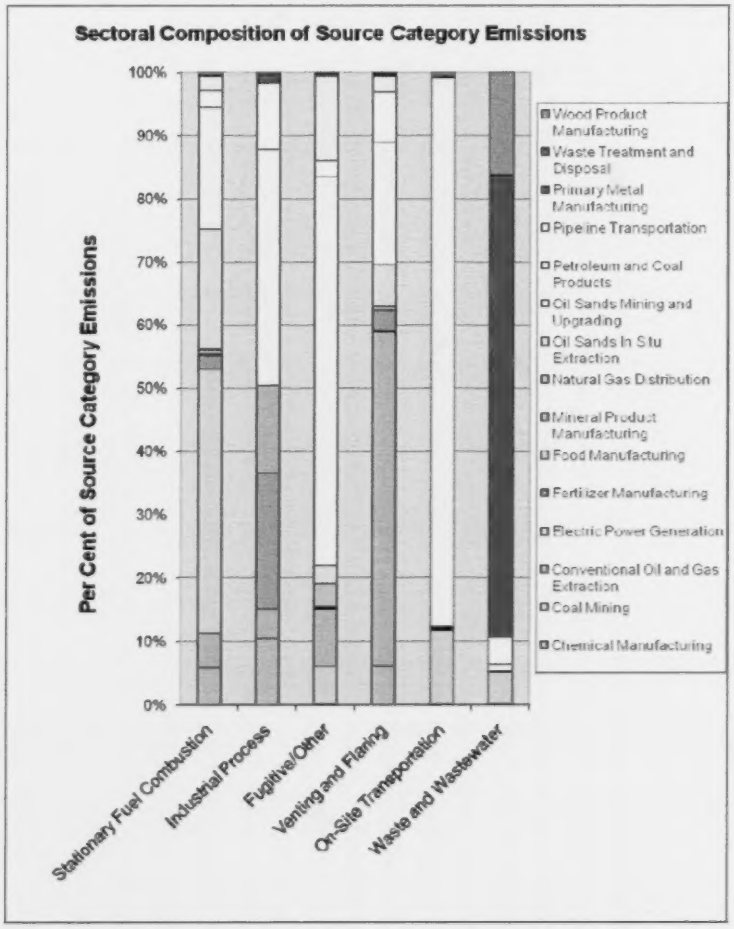

Figure 8: Total reported source category emissions by industrial sector.

5 Comparison with Previous Reporting Periods

The 2011 calendar year marks the ninth consecutive year of mandatory greenhouse gas reporting for large industrial facilities in Alberta. Short-term and long-term trends in reported greenhouse gas emissions in Alberta are explored in this section. To improve comparability of current data with previous years, only facilities whose emissions exceed 50 kt CO_2e are considered for the short-term comparison and only facilities whose emissions exceed 100 kt CO_2e are considered for the long term comparison.

Note: *Comparability of reported emissions between reporting years is additionally limited due to lack of information and consistency regarding calculation methods used to estimate emissions inventories, and variation in the annual facility list from facilities exceeding or falling below the reporting threshold in subsequent years, decommissioning, and reporting voluntarily. Only emissions reported through the national one-window reporting program are included in this analysis, which excludes data received for 2003.*

5.1 Short-term Trend: Comparison of 2010 and 2011 Reported Greenhouse Gas Emissions

The total reported greenhouse gas emissions from Alberta facilities exceeding 50 kt increased by 0.7 Mt from 122.3 Mt to 123.0 Mt between 2010 and 2011; however, the number of facilities emitting above 50 kt that reported greenhouse gas emissions decreased from 153 to 147. By sector, the number of reports received increased in the chemical manufacturing, electric power generation, and oil sands in situ extraction sectors, decreased in the coal mining, conventional oil and gas extraction, food manufacturing, and waste treatment and disposal sectors, and held constant in the remaining sectors. A sectoral comparison of total reported emissions and number of reports received is shown in Table 2 for the 2010 and 2011 reporting years.

Table 2: Number of reports received and total reported emissions by sector for 2010 and 2011.

Sector	Facilities Reporting		Emissions (kt CO2e)		Change in Reported Emissions
	2010	2011	2010	2011	
Chemical Manufacturing	10	11	6,586	7,080	8%
Coal Mining	5	4	667	649	-3%
Conventional Oil and Gas Extraction	61	55	8,212	7,958	-3%
Electric Power Generation	18	19	45,790	43,594	-5%
Fertilizer Manufacturing	5	5	4,049	4,357	8%
Food Manufacturing	2	1	130	75	-42%
Mineral Product Manufacturing	4	4	1,967	2,020	3%
Natural Gas Distribution	1	1	204	146	-28%
Oil Sands In Situ Extraction	19	20	18,722	20,192	8%
Oil Sands Mining and Upgrading	7	7	28,103	28,845	3%
Petroleum and Coal Products	5	5	4,024	4,054	1%
Pipeline Transportation	4	4	2,577	2,757	7%
Primary Metal Manufacturing	2	2	368	381	4%
Waste Treatment and Disposal	4	3	280	208	-26%
Wood Product Manufacturing	6	6	621	637	3%
Total	**153**	**147**	**122,298**	**122,954**	**1%**

The change in total reported emissions from 2010 to 2011 for each industrial sector is illustrated in Figure 9. Relatively small increases (less than 1 Mt) in sectoral emissions were reported in the chemical manufacturing, fertilizer manufacturing, mineral product manufacturing, oil sands mining and upgrading, petroleum and coal products, and pipeline transportation sectors. Small decreases (less than 1 Mt) were reported in the conventional oil and gas extraction, food manufacturing, natural gas distribution, and waste treatment and disposal sectors. Negligible change was reported in the coal mining, primary metal manufacturing and wood product manufacturing sectors. The most notable changes occurred in the electric power generation and oil sands in situ extraction sectors. A decrease of 2.20 Mt was reported by the electric power generation sector largely due to the shutdown of TransAlta's Sundance 1 and 2 units. An increase of 1.47 Mt was reported by the oil sands in situ extraction sector.

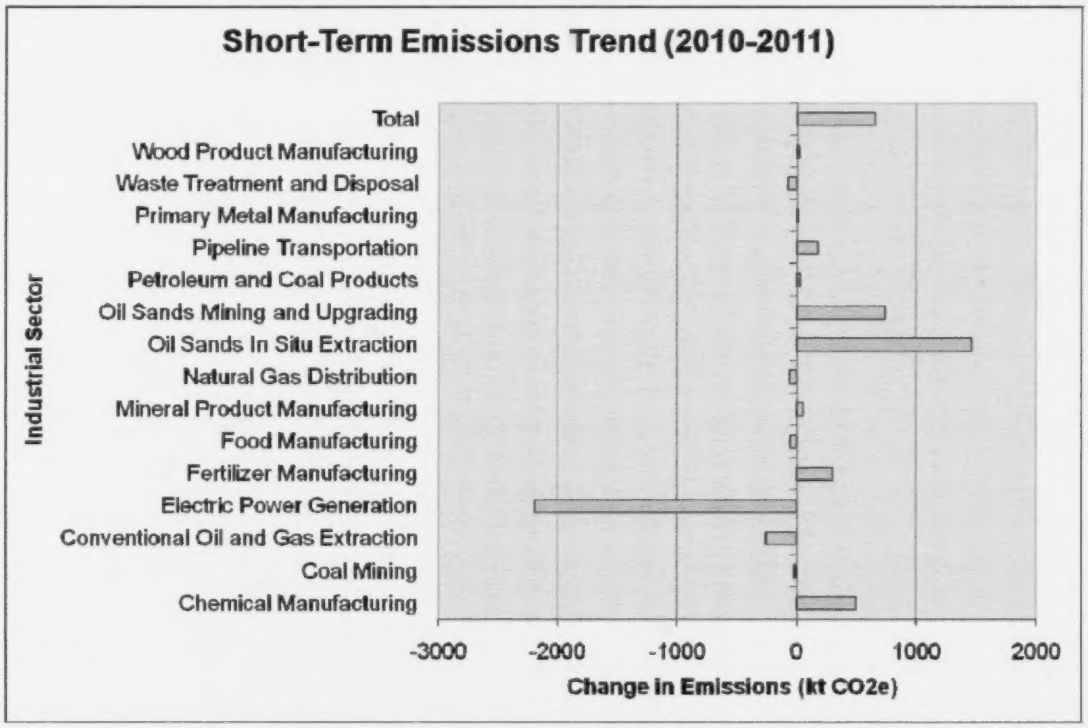

Figure 9: Change in total reported greenhouse gas emissions by industrial sector from 2010 to 2011.

5.2 Long-term Trend: Comparison of 2004 and 2011 Reported Greenhouse Gas Emissions

From 2004 to 2011, the total number of facilities whose emissions exceeded 100 kt in Alberta increased from 92 to 103. Concurrently, the total reported emissions increased by 12.6 per cent from 106.7 Mt to 120.1 Mt. By sector, the largest changes in the number of facilities reporting were seen in the conventional oil and gas and oil sands in situ extraction sectors. A comparison of total reported emissions and number of reports received by sector for 2004 and 2011 is shown in Table 3.

Table 3: Number of reports received and total reported emissions by sector for 2004 and 2011.

Sector	Facilities Reporting		Emissions (kt CO2e)		Change in Reported Emissions
	2004	2011	2004	2011	
Chemical Manufacturing	10	10	7,026	7,018	0%
Coal Mining	1	4	185	649	251%
Conventional Oil and Gas Extraction	31	22	8,523	5,861	-31%
Electric Power Generation	16	18	46,771	43,539	-7%
Fertilizer Manufacturing	5	5	4,673	4,357	-7%
Mineral Product Manufacturing	3	4	2,134	2,020	-5%
Natural Gas Distribution	1	1	269	146	-46%
Oil Sands In Situ Extraction	9	20	7,664	20,192	163%
Oil Sands Mining and Upgrading	5	7	21,587	28,845	34%
Petroleum and Coal Products	3	3	3,938	3,889	-1%
Pipeline Transportation	4	4	3,232	2,757	-15%
Primary Metal Manufacturing	1	1	276	303	10%
Wood Product Manufacturing	3	4	390	498	28%
Total	**92**	**103**	**106,667**	**120,075**	**13%**

Some similarities noted in the short-term trend are also visible in the longer-term trend, illustrated in Figure 10. For example, small or negligible changes in reported emissions are seen in the wood product manufacturing, petroleum and coal products, natural gas distribution, and primary metal manufacturing sectors. The conventional oil and gas extraction sector reported significant decreases in both the short term and the long term, and the oil sands in situ extraction, oil sands mining and upgrading sectors similarly reported significant increases. In the conventional oil and gas extraction sector, reported greenhouse gas emissions declined by greater than 30 per cent, with the number of facilities decreasing by 9. In the oil sands in situ extraction sector, the number of facilities increased from 9 to 20, with an emissions increase of 12.5 Mt. In the oil sands mining and upgrading sector, the number of reporting facilities increased by two, with emissions increasing by 7.3 Mt. Other notable trends that are less consistent with the short-term observations include a moderate decrease of emissions in the fertilizer manufacturing and pipeline transportation sectors and a moderate increase of emissions in the coal mining sector.

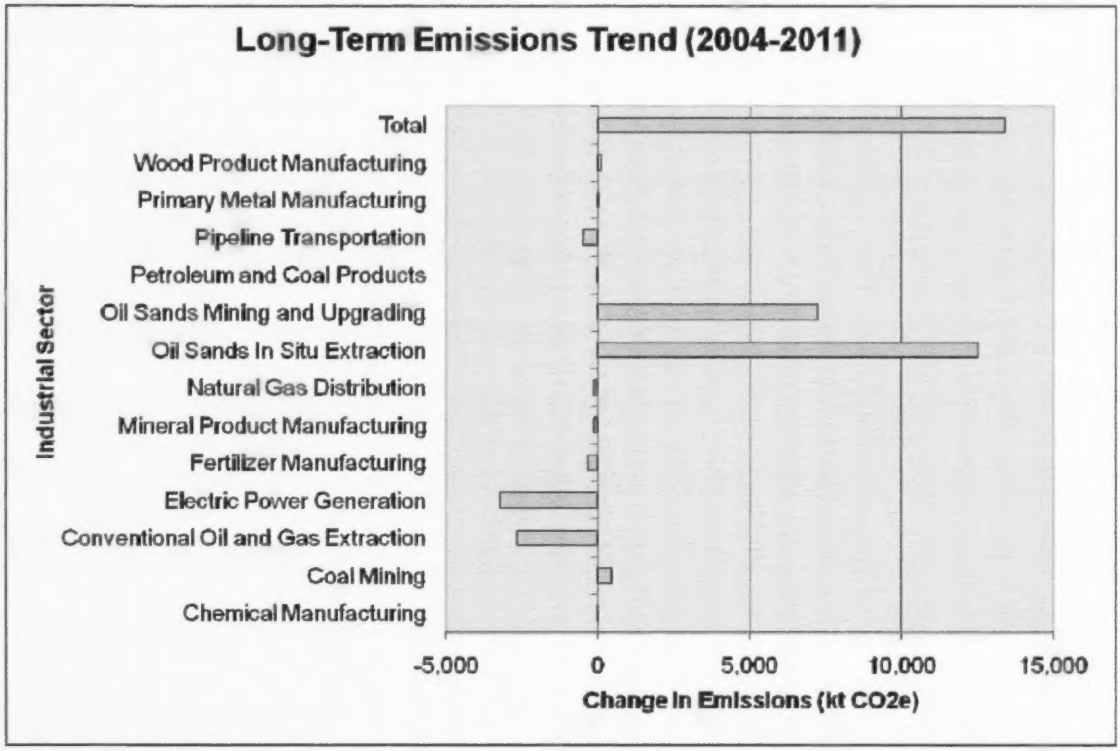

Figure 10: Change in reported total greenhouse gas emissions by sector from 2004 to 2011.

5.3 Comparable Facilities

With a mandatory reporting threshold now at 50,000 tonnes CO_2e, it can be meaningful to remove the effects of facilities rising and falling below the threshold. For this purpose, the concept of comparable facilities is used. Comparable facilities are all facilities that have reported greenhouse gas emissions in every year from 2004 to 2011, of which there are 74. The total reported emissions from 2004 to 2011, for comparable facilities, are shown in Table 4. In the short term, the reported greenhouse gas emissions have increased from 95.0 Mt in 2010 to 95.2 Mt in 2011, and have increased from 91.6 Mt in 2004.

Table 4: Total annual reported greenhouse gas emissions for comparable facilities in Alberta.

	2004	2005	2006	2007	2008	2009	2010	2011
Total Reported Emissions (Mt CO2e)	91.6	93.0	97.9	96.6	93.2	91.6	95.0	95.2

6 National Reported Greenhouse Gas Emissions

This section of the report examines the 2011 greenhouse gas emissions data for facilities that emitted over 50 kt (also includes facilities that did not exceed the 50 kt threshold, but voluntarily reported), collected through the harmonized reporting system for all of Canada. Note that for the Alberta reported facility emissions, facilities that did not report to Environment Canada and only reported to Alberta are included.

6.1 2011 Reported Greenhouse Gas Emissions by Province

A total of 254.4 Mt of greenhouse gas emissions were reported by large industrial facilities emitting above 50 kt (also includes facilities that did not exceed the 50 kt threshold, but voluntarily reported) in Canada for the 2011 reporting period. The proportional contribution from provinces and territories to the national reported emissions is shown in Figure 11. The 164 facilities located in Alberta were the source of the largest portion of total reported greenhouse gas emissions, contributing 48.5 per cent of the total (122.3 Mt). Facilities in Ontario reported the next largest share, with 19.4 per cent of the total (49.3 Mt). Facilities in Saskatchewan and Quebec accounted for 8.8 and 7.9 per cent of the total, at 22.5 Mt and 20.2 Mt, respectively. Facilities in British Columbia contributed 5.6 per cent of the total (14.2 Mt), facilities in Nova Scotia contributed 3.9 per cent (9.9 Mt), and facilities in New Brunswick contributed 3.1 per cent (7.9 Mt). The remaining provinces and territories—including Newfoundland and Labrador, Manitoba, the Northwest Territories, Nunavut, and Prince Edward Island—contributed a combined total of 2.8 per cent of reported emissions (7.1 Mt).

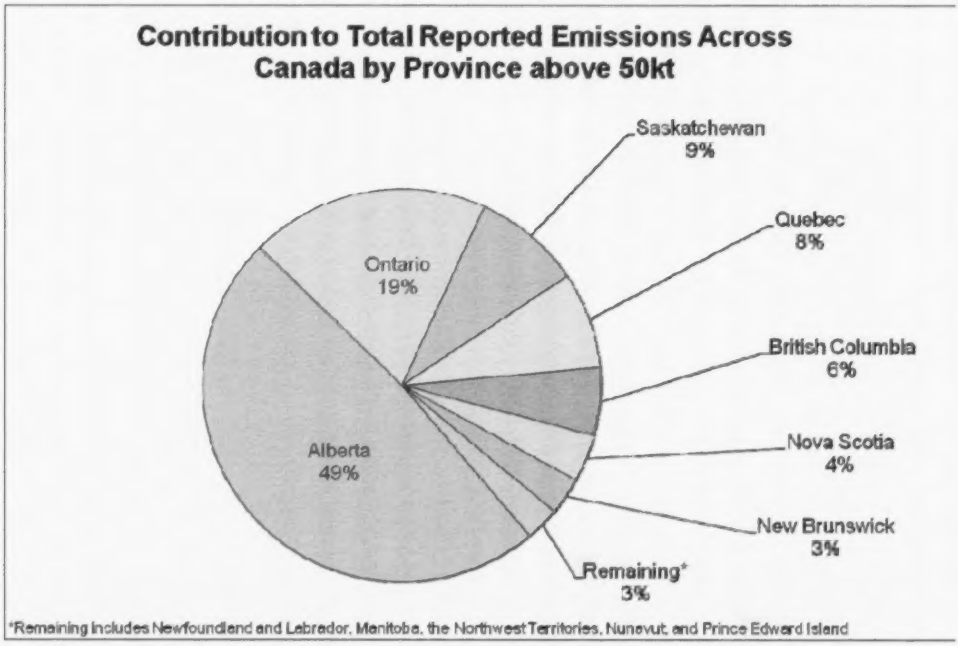

Figure 11: Total reported facility greenhouse gas emissions across Canada by Province/Territory

6.2 2011 Facility Greenhouse Gas Emissions as a Portion of Total Provincial Emissions

It is important to note that emissions reported through the *National Mandatory Greenhouse Gas Reporting Program* represent only a fraction of total greenhouse gas emissions from each province. Total greenhouse gas emissions for Canada and each province/territory are described in the *National Inventory Report: 1990-2011*, published by Environment Canada. For 2011, the emissions reported through the mandatory industrial reporting program as a portion of total provincial emissions described in the inventory are shown in Figure 12. Reported greenhouse gas emissions from large industrial facilities represent varying fractions of the provincial inventory, as high as 88 per cent for Nunavut and as low as 0 per cent for the Yukon. Alberta's reported greenhouse gas emissions from large industrial facilities represent 51 per cent of Alberta's provincial inventory.

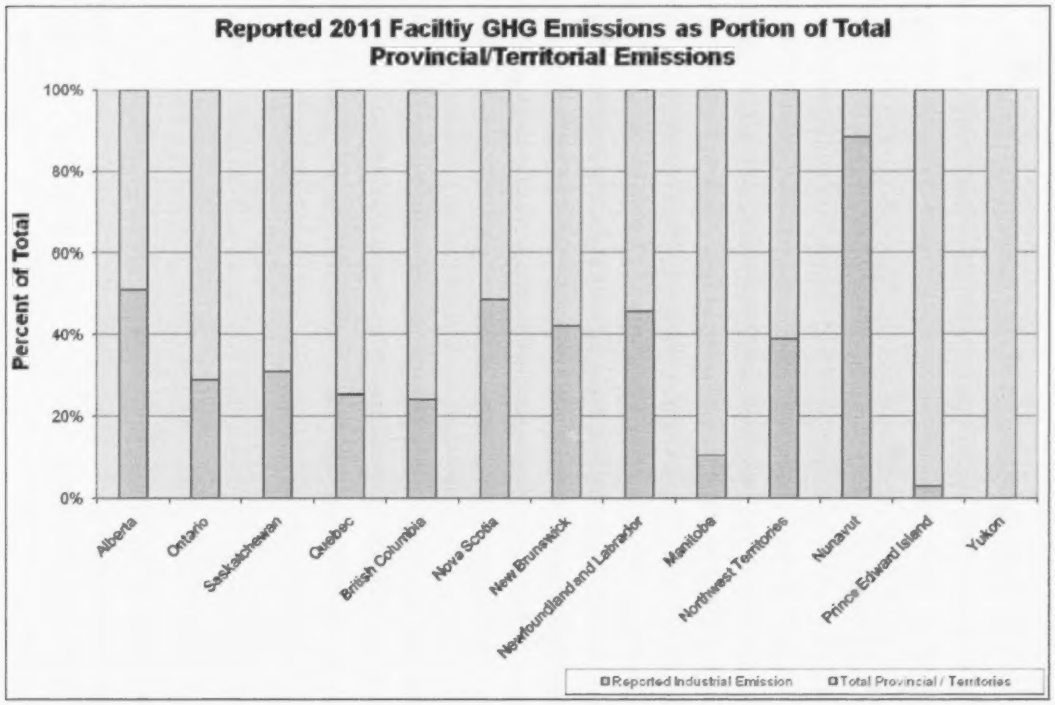

Figure 12: Reported 2011 facility greenhouse gas emissions as a percentage of total estimated Provincial/Territorial emissions

7 Data Confidentiality and Access

7.1 Confidentiality Request Process

The *Specified Gas Reporting Regulation* permits organizations submitting greenhouse gas emissions reports to request confidentiality for information contained in the report. Confidentiality may be granted for up to five years if the information is determined to be commercial, financial, scientific or technical information that would reveal proprietary business, competitive or trade-secret information about a specific facility, technology or corporate initiative. The confidentiality request and review process is outlined in Figure 13. The following factors are considered during the confidentiality review process:

- Whether disclosure could reasonably be expected to significantly harm the competitive position of the specified gas reporter;
- Whether disclosure could reasonably be expected to interfere significantly with the negotiating position of the specified gas reporter;
- Whether disclosure could reasonably be expected to result in undue financial loss or gain to any person or organization;
- The availability of the information from other public sources; and
- Whether there are any other competing interests that would suggest disclosure of the information is warranted.

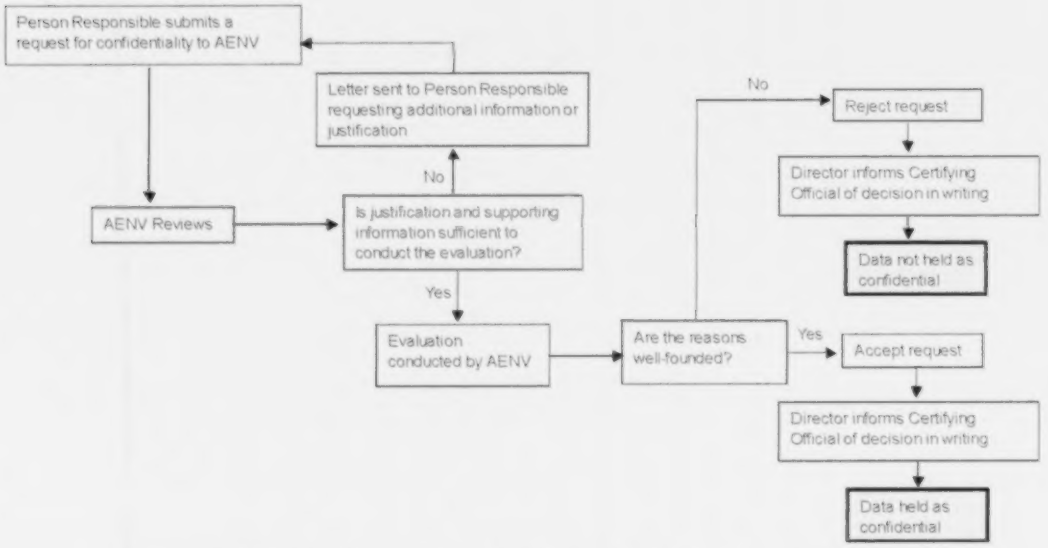

Figure 13: Confidentiality process for the Specified Gas Reporting Program

7.2 2011 Confidentiality Requests and Decisions

There were nine Alberta facilities that submitted confidentiality requests to Alberta Environment and Sustainable Resource Development for the 2011 reporting period. Five of the nine facilities requested that Section A of their report be kept confidential. Section A of the 2011 specified gas report contains greenhouse gas emissions data by source category. One of these five facilities additionally requested that Section E of the report, containing additional comments and information about the facility, be kept confidential. Confidentiality was granted for all five of these requests. The remaining four facilities requested that Section B of their report be kept confidential, specifically the electrical power consumption and generation. These requests were not granted. Two of these four facilities additionally requested that the CO_2 captured and sent off site be kept confidential. Confidentiality was granted for these portions of the two requests. Table 5 shows the facilities that requested confidentiality for 2011 and the corresponding decision by the Director.

Table 5: Confidentiality request decisions for 2011 greenhouse gas data.

Company Name	Facility Name	Decision:
Graymont Western Canada	Exshaw	Section III (A) deemed confidential for 5 years.
Suncor Energy	Edmonton Refinery	Sections III (A) and (E) deemed confidential for 5 years.
Imperial Oil	Strathcona Refinery	Section III (A) deemed confidential for 5 years.
Imperial Oil	Cold Lake	Section III (A) deemed confidential for 5 years.
Air Products Canada	Edmonton Hydrogen	Section III (A) deemed confidential for 5 years.
Dow Chemical Canada	Prentiss Chemical Manufacturing	Section III (B) not deemed confidential.
Dow Chemical Canada	Fort Saskatchewan Chemical Manufacturing	Section III (B) not deemed confidential.
MEGlobal Canada	Prentiss Chemical Manufacturing	Section III (B) - CO2 Captured or sent off site deemed confidential for 5 years.
MEGlobal Canada	Fort Saskatchewan Chemical Manufacturing	Section III (B) - CO2 Captured or sent off site deemed confidential for 5 years.

7.3 Publishing Greenhouse Gas Data

Section 7 of the *Specified Gas Reporting Regulation* permits the Director to publish data and information in any specified gas report in any form or manner the Director considers appropriate. Alberta Environment has published an annual report on the results of the *Specified Gas Reporting Program* since 2003 when the mandatory greenhouse gas reporting program began.

7.4 Requesting Greenhouse Gas Data

Written requests for information contained in a submitted specified gas report that has not been deemed confidential can be submitted to the designated Director at AENV.GHG@gov.ab.ca. The Director shall respond to these requests within a reasonable amount of time. The process for requesting non-confidential greenhouse gas data from Alberta Environment and Sustainable Resource Development is outlined in Figure 14.

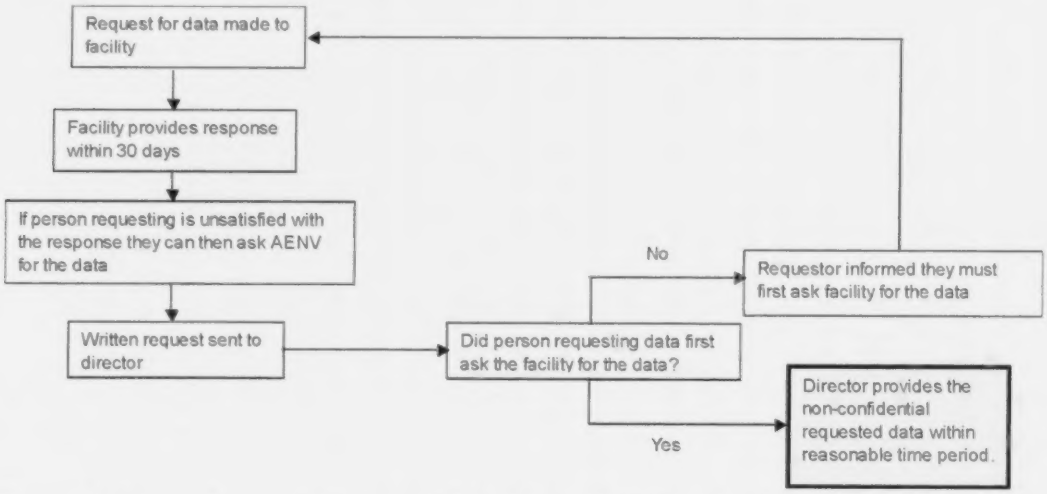

Figure 14: Process for requesting non-confidential greenhouse gas data from Alberta Environment.

Glossary of Terms

Biomass: Plant materials, animal waste or any product made of either of these and includes without limitation wood and wood products, charcoal, agricultural residues and wastes including organic material above and below ground, both living and dead, such as trees, crops, grasses, tree litter, roots, municipal and industrial wastes where the organic material is biological in origin, landfill gas, bio-alcohols, black liquor, sludge gas, animal or plant-derived oils.

Carbon dioxide equivalent (CO_2e): Carbon dioxide equivalent is the concentration of CO_2 that would cause the same amount of absorption of infrared radiation in the atmosphere as another greenhouse gas. CO_2e is calculated by multiplying the emissions of a greenhouse gas by an established global warming potential to get an equivalent quantity of carbon dioxide. Using CO_2e permits the calculation of total greenhouse gas emissions for a particular source.

Direct emissions: Release of specified gases to the air from sources located at a facility, expressed in tonnes on a CO_2e basis.

Facility: Any plant, structure or thing where an activity listed in Section 2 of the Schedule of Activities to the *Environmental Protection and Enhancement Act* occurs, and a site or one or more contiguous or adjacent sites that are operated and function in an integrated fashion where an activity listed in any of Sections 3 to 11 of the Schedule of Activities to the *Environmental Protection and Enhancement Act* occurs, including all the buildings, equipment, structures, machinery and vehicles that are an integral part of the activity.

Flaring emissions: Flaring emissions are direct emissions from the controlled combustion of a gas or liquid stream produced on site not for the purpose of producing energy and includes without limitation emissions arising from waste petroleum incineration, hazardous emissions prevention systems (whether in pilot or active mode), well testing, natural gas gathering systems, processing plant operations, crude oil production, pipeline operations, petroleum refining and chemical fertilizer and steel production.

Global warming potential: Global warming potential is the relative measure of the warming effect that the emission of a specified gas might have on the Earth's atmosphere calculated as the ratio of the time-integrated radiative forcing that would result from the emission of one kilogram of a given specified gas to that from the emission of one kilogram of carbon dioxide.

Industrial process emissions: Direct emissions from an industrial process involving chemical or physical reactions, other than combustion, and where the primary purpose of the industrial process is not energy production. This includes mineral, metal and chemical production. This source category is more sector-specific than stationary fuel combustion and is not found in all industrial sectors.

On-site transportation emissions: On-site transportation is a greenhouse gas source category with direct emissions resulting from fuel combustion in machinery used for the on-site transportation of products and material integral to the production process. Examples are the

transportation of raw or intermediate products and materials within the production process; such as equipment used at an oil sands operation to mine and/or move materials to subsequent on-site processing, or equipment used at above or below ground mining operations to mine and/or move mined materials or other intermediate products or materials to different on-site production processes.

Fugitive/other emissions: Fugitive/other emissions are direct emissions that do not fall under stationary fuel combustion emissions, industrial process emissions, venting emissions, flaring emissions, on-site transportation emissions, or waste and wastewater emissions and includes without limitation intentional or unintentional releases of gases arising from the production, processing, transmission, storage and use of solid, liquid or gaseous fuels. In general, emissions from fugitive/other sources are a result of the handling or processing of various types of fuel in the fossil fuel industry. Fugitive/other sources include leaks from natural gas transmission lines and processing plants, accidental releases from oil and gas wells and releases from the mining and handling of coal.

Perfluorocarbons (PFCs): Perfluorocarbons are synthetic industrial gases emitted in small quantities but are powerful greenhouse gases with global warming potential of hundreds to thousands of times that of carbon dioxide. Perfluorocarbons include the following PFC species: CF_4, C_2F_6, C_3F_8, C_4F_{10}, c-C_4F_8, C_5F_{12}, and C_6F_{14}. Only PFC emissions from industrial process and industrial product use are reported under the *Specified Gas Reporting Program*. Sources of PFC emissions from industrial process and industrial product use include aluminum production and foam blowing.

Specified gas: Specified gases are those primary greenhouse gases identified in the *Specified Gas Reporting Regulation*, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride.

Stationary fuel combustion emissions: Stationary fuel combustion emissions are direct emissions resulting from non-vehicular combustion of fossil or biomass fuel for the purpose of producing energy but do not include biomass combustion CO_2 emissions. Stationary fuel combustion is a common source of greenhouse gas emissions and is produced in most industrial sectors. The stationary fuel combustion source category includes on-site waste incineration if the waste is combusted for the purpose of energy production.

Venting emissions: Venting emissions are direct emissions from intentional releases to the atmosphere of a waste gas or liquid stream and includes without limitation emissions of casing gas, associated (or solution) gas, treater, stabilizer, dehydrator off-gas, blanket gas and emissions from pneumatic devices which use natural gas as a driver, compressor start-up, pipeline and other blowdowns and metering and regulation station control loops.

Waste and wastewater emissions: Waste and wastewater emissions are direct emissions from disposal of waste and waste or wastewater treatment and includes without limitation sources of emissions from on-site waste disposal and waste or wastewater treatment at a facility such as landfilling of solid waste, flaring of landfill gas, treatment of liquid waste and waste incineration.

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